Positional Control with Biological Clocking

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Abstract

Nanocomputing is a paradigm that is promising to provide the speed and power of supercomputers at very small physical size – Small and Beautiful. However, the core abstractions of nanocomputing need to incorporate the essential properties of the physical systems in general and the passage of time in particular.

Life is nanotechnology that works. It is a system that has many of the characteristics theorists seek. The study of biology in the development of nanotechnology for medical applications is important because it provides guiding principles and suggests useful components. A key lesson from biology is the scale of structural components. Scalability in conventional computing systems is a challenge. However, biological systems that are very important in healing demonstrate rapid scalability. The emphasis is on repeatable behavior rather than on performance optimization. The lower energies involved in non-covalent interactions make it much more convenient to work on the nanometer scale utilizing the biological principle of self-assembly.

This article positions biological clocking as the "Standard Time" or the "Big Time" working with small and beautiful.

Keywords: Biocomputing, Self-Assembly, Position Control, Biological Time, Biological Rhythm. Scalability, Nanomedicine

1. Introduction

"If mental processes are indeed physical processes, then there is something it is like, intrinsically, to undergo certain physical processes. What it is for such a thing to be the case remains a mystery." ***– Nagel T, "What Is It Like to Be a Bat?", Philosophical Review, Vol. 83, Pp 435–450***

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Corresponding Author: Gopal Tadepalli, gopal@annauniv.edu
Citation: Tadepalli, G. (2021). Positional Control with Biological Clocking. *Academia Letters*, Article 1542. https://doi.org/10.20935/AL1542.

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The foundations of computing, rooted in Turing, Church, and von Neumann, are primarily about the transformation of data not about the physical dynamics. The core abstractions in these foundations need to be supported by timing controls to integrate computing with physical processes. A master clock generator is the basis for such necessary controls in the **computer**. Computing needs Time. There are two major types of controls in computer systems, namely hardwired control and microprogrammed control. This is the essential control without which the computer system has no physical purpose. "Interrupt" is a simple mechanism to indicate the need for attention or a synchronous event in software indicating the need for a change in execution. "Interrupt" mechanism is completely different in the context of biology.

Every computer system has its own set of limitations stemming from the **centralization** such as the master clock and **synchronous communication** that warrants the communicating elements to wait for one another. The argument that computers have become faster while the physical processes remained slow has not helped in addressing the rapid scalability concerns.

The question of the slow biological change in relation to available geological time that governs the physical dynamics is indeed a serious theoretical challenge. The mechanisms of life are revealed when we understand their molecular details. The molecular understanding of biology plays the major role in guiding drug discovery, and molecular-level understanding of biology is fundamental in developing diagnostic methods.

2. Biological Clock and Rhythm

Can Nanocomputing model the Biological clock which is an organism's innate timing?

A biological clock is located in two tiny structures called the Suprachiasmatic Nuclei [SCNs] in theleft and the right hypothalamus and bordering on the third ventricle. The neurons of these two nuclei are among the smallest in the brain. The SCN may be the regulator based on multiple oscillators, like the system that generates "Standard Time" or "Big Time". There are emerging methods to control this system.

For historical reasons this concept of time is missing in the computational models that are said to be emulating the human brain. The conflict among the mechanical, physical and biological times is not new. The 24 X 7 living in advanced industrial societies has rapidly made such conflicts very intensive. Timing may not be "everything". But it is useful to note that many nuclear accidents happened at night. Space medicine is mostly about putting the astronauts to sleep while in the orbit. Melatonin is a hormone that regulates the sleep - wake cycle. It is primarily released by the pineal gland and even light can impact the functioning of this gland. The author is working on the functionality and model for the Pineal Gland from the perspectives of consciousness. Heart attacks usually happen between 6AM and Noon.

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Nanomedicine needs the biological clock to rapidly scale its structural impact while assuring minimal loss to the associated ecology.

The analysis of scaling in biology requires:

1. Measuring how a biological characteristic changes with size
2. Understanding some useful properties of logarithms and statistical regression
3. Application of relevant physical laws

Modeling biology spanning different scales is an open challenge. Multiscale models of the human body targeting complex processes span many time and length scales of biological organization.

Biological clocks are fundamental to the functioning of life, to its organization and coordination of behavior. There are two major technical challenges. One is the positional control [holding and positioning molecular parts to facilitate assembly of complex structures] and the other is self-replication. Biological rhythm is the crux in the positional control vital for rapid scalability of biological structures. The author works on applying consciousness based on mantras [or chants that became music] to assure this scalability that is both beautiful and timed in harmony with the ecology.

3. Conclusion

This paper is an essay on the potential interface among Nanocomputing, Biology and Medicine. Biology has been well know for rapid scaling of the molecular structures that is essential in hastening the process of healing. The conventional models of computation has severe scalability challenges. This paper is on modeling the biological clocks and rhythms that ensure positional control for self-assembly and rapid scalability of biological structures. Consciousness is the methodology for healing.

4. Acknowledgements

The author places on record sincere thanks to Anna University, Chennai for facilitating this research. Thanks are also due to the various committees of the series of conferences on Theory and Applications of Models of Computation [TAMC] and 21st Century Norbert Wiener.

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